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The Impact of Survival Processing and Collaborative Inhibition on Memory Performance

Lindsey Hardin
University of Mississippi. Sally McDonnell Barksdale Honors College

THE IMPACT OF SURVIVAL PROCESSING AND COLLABORATIVE INHIBITION ON MEMORY PERFORMANCE

by
Lindsey Hardin

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Approved by

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Advisor: Dr. Matthew Reysen

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Reader: Dr. Mervin Matthew

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Reader: Dr. Michael Allen

Abstract

This study examines the effects of survival processing and collaborative inhibition on memory performance. The purpose of this research is to determine whether survival processing produced more accurate memory recall than pleasantness processing, as well as determine the impact of collaborative inhibition when compared to nominal groups. In this experiment, participants were given the instructions to rate a given list of words based on survival or pleasantness depending on which scenario they were assigned to. Then, the participants recalled the list of words in either collaborative groups or nominal groups. The results indicated that the survival condition did produce better memory recall than the pleasantness condition and that the nominal groups outperformed the collaborative groups. However, when experts were tested collaborative inhibition was eliminated.

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Charles Darwin's theory of evolution and survival set the foundation for many more ideas and experiments based on survival and human instincts. Researchers have since begun testing how the necessity of survival impacts peoples' behaviors and responses to everyday life. The following experiment focuses on survival processing and its relationship with collaborative inhibition.

Survival processing is the idea that our minds are tuned to better process items or events that pertain to personal survival. Therefore, information that is relevant to survival, such as food sources and potential predators, will be more easily remembered than information that has no connection to survival. In order to test this theory, the relationship between survival processing and pleasantness processing was tested. Pleasantness rating is notably one of the more successful methods of producing accurate memory recall due to deep processing. However, do the pleasantness condition results out perform the survival rating condition? Does the necessity of survival significantly increase a person's information processing ability?

Alongside survival processing, this experiment tests collaborative inhibition. Collaborative inhibition is the theory that recalling information in collaborative groups, several individuals remembering together, as opposed to nominal groups, individuals remembering separately and combing their responses harms a person's overall recall performance. This theory suggests that group members' responses' interfere with an individuals recall cues and hinder an individual's overall memory recall capability.

By pairing survival processing and collaborative inhibition, one hopes to discover how the mind best recalls information. Knowing which process produces the best memory recall will not only further our knowledge of the mind and human instinct, but will also enhance the way information is gathered from individuals.

A study by Nairne, Pandeirada, and Thompson attempted to test the adaptive memory theory to determine whether human memory systems are formatted to be more receptive to remember information that is processed for survival. The following experiment reveals the influence survival has on memory performance.

In the first experiment, three hundred undergraduate students from Purdue were randomly assigned to one of six experimental groups to test different memory retention processes. In each experimental condition, identical words were presented in each experimental condition in a random order. The words were presented on a computer screen for 5 seconds along with a rating scale where the participant ranked the words on a 5 level scale according to their experimental condition (Nairne et al, 2008).

The first group ranked the given words based on their importance to survival. The participants in this group were presented with a situation were they needed to survive yet they did not have the supplies needed. They ranked the given words by how relevant they were to their survival given the prompted situation (1 being irrelevant and 5 being extremely relevant). The second group ranked the words based on how pleasant the participant found to word (1 being unpleasant and 5 being extremely pleasant). The third group ranked the words based on the participant's ability to form imagery of the word presented (1 low imagery and 5 high imagery). The fourth group ranked the words based on the participant's ability to relate the word with personal experiences (1 very difficult

and 5 extremely easy). The fifth group ranked the words based on pleasantness; however, the first two letters of the words are switch. Therefore, the participants must first switch the first two letters and then rate how pleasant the participant finds the words (1 unpleasant and 5 extremely pleasant). Lastly, the participants in the sixth group were given the words and were told simply to remember the words for a future memory test. No scale was given. Immediately after the rating process, the participants were asked to recall digit strings for 2 minutes. Then the participants were asked to write down all the words that they remembered from the test on a sheet of paper (Nairne et al, 2008).

The authors discovered that people were more likely to recall the words if the information was presented in the survival experimental condition. While the average memory retention was slightly higher in the pleasantness condition, overall retention was better in those in the survival experimental condition The authors suggest that human memory systems are more tuned to remember information that is processed for survival (Nairne et al, 2008).

In experiment 2, the procedure was very similar. Twenty-four participants were tested individually and were presented with 16 words under a survival scenario and 16 words under a vacation scenario. The words were divided into 4 blocks of 8 words with a randomly determined order. Just like experiment 1, participants were to rank the words on a scale from 1 to 5 based on how relevant the participant found the word to the given scenario (survival or vacation) (Nairne et al. 2008).

The authors, discovered that people were more likely to recall the words if the information was presented in the survival experimental condition. Response time did not differ much between the two groups; however, the average retention was substantially

greater given the survival scenario. In accordance with experiment 1, the authors suggest that human memory systems are more tuned to remember information that is processed for survival (Nairne et al. 2008).

In addition, Weldon and Bellinger's study, "Collective Memory: Collaborative and Individual Processes in Remembering," helps to further explain collaborative and individual memory processing. However, instead of focusing on adaptive memory, the following study focuses on the recall of random words and images and whether or not collaborative inhibition is present in group recall settings.

Using two experiments, this study attempts to determine the recall ability of both individuals and collaborative groups to determine if there is a statistically significant difference in recall performance (Wldon & Bellinger, 1997).

In the first experiment, participants were tested in groups of 3 where each subject took place in one of the four testing conditions. Throughout the experiment, two variables were manipulated within subjects. The stimulus given was either in the form of pictures or words and the level of processing was either shallow or deep. The participant's recall was tested twice; therefore, the possible conditions were as follows: Individual-Individual (II), Collaborative-Collaborative (CC), Individual-Collaborative (IC), and Collaborative-Individual (CI). Each testing condition consisted of 16 groups of 3 participants (Weldon & Bellinger, 1997).

For the shallow processing task, participants were shown a set of slides and were told to rank the graphic quality of the image and words from 1 to 5 *(poor to high quality).* For the deep processing task, participants were shown another set of slides containing an image or words and were told to rank the pleasantness of the item from 1 to 5 (*very*

unpleasant to very pleasant) (Weldon & Bellinger, 1997).

Following a 5-minute distractor task, the participants were given two recall tests that were dependent on their testing condition (II, CC, IC, CI). For the individual condition, the participant was given a blank sheet of paper and was told to write down every image and words that they remembered from both the shallow and deep encoding tasks. For the collaborative condition, participants worked together in a group to recall as many images and words as they could remember from both the tasks. One group member was the designated recorder, but was still told to participate in the collaboration. Each testing condition allowed 7 minutes of recall and after the first recall test the participants were immediately given the instructions for their second recall test (Weldon & Bellinger, 1997).

The authors discovered that groups outperformed individuals in regards to memory recall; however, nominal groups (pooled individuals) out performed collaborative groups. This experiment revealed that while collaboration may have proved better recall over the individual groups it did hindered individual recall. To optimize recall, individuals should be tested separately and then their responses should be brought together (Weldon & Bellinger, 1997).

In the second experiment, the authors tested to see if the previous conclusions could be generalized to the recall ability of individuals who listened to a prose. 24 participants were randomly placed into one of 5 groups: II-written, II-oral, IC, CC, CI. All testing conditions consisted of groups of 3 participants except for II-oral where each was tested individually. In each condition the participants listened to the selected story two times. After a 5-minute distractor task, the participants received their recall

instructions depending on which testing condition they were in. In the collaborative condition, the participants orally told the story from beginning to end to the best of their ability. The recall was recorded to rate recall. In the II-oral condition, the participants were told to recite the story two times to the best of their ability. This was also videotaped. In the remaining individual conditions participants were told to write down the story on a piece of paper as they remembered it. Immediately following the first recall, the participants were given the instructions for their second testing condition. In each condition the participants were given 10 minutes to complete their recall (Weldon & Bellinger, 1997).

The authors discovered again collaborate inhibition was present. The collaborative group once again outperformed individuals and recalled less than pooled individuals. This experiment found that the collaborative deficit seemed larger with the story than list recall. In the story experiment, the collaborative groups appeared to be dependent on the strongest individual whereas in the list experiment the collaborative groups recalled much more than one individual in the group (Weldon & Bellinger 1997).

The previous two experiments suggest that collaboration inhibits overall individual memory recall. However, both of these studies have tested participants with no previous experience with the tested material. The following experiment by Meade, Nokes, and Morrow compares the successful recall capability of experts vs. non-experts to determine whether having knowledge of a topic leads to more successful group recall than having no knowledge of a topic (Meade et al, 2009).

In this experiment, each participant was selected for one of three expertise levels (non-pilots, novices, and experts). Each level had 32 participants. Half of the participants

recalled individually while the other half were placed in collaborative groups (Meade et al, 2009).

Each participant was given four scenarios (simple or complex) in which they could read at their individual pace. In order to prevent short-term memory storage, the participants were given a 1-minutes filler task immediately following the given scenarios. Then the participants were asked to recall, aloud, as much information about the scenarios as they could and then write down information from each scenario without making any guesses. Participants in the individual recall group did the latter individually, while those in the collaborative recall group were paired with an individual of the same expertise level. One person in each collaborative group recorded the team's recall on a piece of paper. Following the recall test, the participants completed a problem-solving task and then concluded with a demographic and neuropsychological assessment (Meade et al, 2009).

The authors discovered that while the novice and the non-pilot groups experienced collaborate inhibition the expertise groups experienced collaborative facilitation. This result is likely due to expert pilots' domain knowledge, as well as their being trained to repeat orders. Throughout the collaborative recall process the pilot experts repeated information back and forth, which likely increased their ability to more successfully recall the scenarios. The experts' domain knowledge allowed the pilots to focus more on the specifics of the scenario instead of the simple information that the novices had no knowledge of. These results indicate that experts in a given topic have better collaborative recall than non-experts, and that expert collaborate groups enhance individual recall unlike non-expertise collaborative groups (Meade et al, 2009).

While most tests on collaborative recall have been conducted on younger adults, a study by Ross, Spencer, Linardatos, Lam, and Perunovic examines the effects of collaboration on older adults. Collaborative recall appears to hinder overall individual recall for young adults; however, will the same results apply to older adults who tend to rely on cues to recall memory (Ross et al, 2004)?

In this experiment, 60 older couples (65 or older) were asked to look at a catalogue and decide together what items they would purchase the next time they went to the grocery store. The participants were asked to select 25 items from a list of 70. Once the couple had finished selecting their items they were not allowed to view the catalog again (Ross et al, 2004).

After completing the catalogue process, each spouse was interviewed individually. The researcher asked questions such as their "background, health status, grocery shopping routine and familiarity with the city.' These questions were as follows: 'Who decides what to buy?' 'Who actually does the shopping?' 'Who is more familiar with the city?' and 'Who does the most driving?" The participants were asked to respond in one of four ways (Primarily Husband, Primarily Wife, Equally, or Other – specify). One hour prior to the shopping portion of the experiment, the participants were asked filler questions to prevent them from thinking about their grocery list (Ross et al, 2004).

The participants were randomly selected to either shop collaboratively with their spouse or shop individually. Those selected to shop collaboratively were given a single shopping cart and were told to fill it with everything they remembered selecting from the grocery catalogue. In this condition, a researcher followed silently behind the couple recording the behaviors of each spouse. Those selected to shop individually were given

the same task; however, each spouse had their own shopping cart and was told to shop individually (Ross et al, 2004).

Following the shopping trip, the participants were interviewed again. They were given a list of the shopping items from the previous catalogue in addition to 10 new distractor items. Each participant was instructed to select the 25 items that they had originally selected and then list any distractor items that were not included in the precious catalogue. Those in the collaborative condition conducted this task together with their spouse, while those in the individual condition conducted this task individually (Ross et al, 2004).

Finally, the participants were given a map of their local community and were asked to label 14 landmarks. The names of the landmarks were not visible on the map. Those in the collaborative condition conducted this task together with their spouse, while those in the individual condition conducted this task individually (Ross et al, 2004).

In the grocery portion of this experiment, nominal groups were formed from the individual condition. These groups indicated that the number of personal items in the shopping cart was greater for those in the nominal group than in the collaborative group. However, there were also more items not on their personal list in the carts of those in the nominal group than in the collaborative group (Ross et al, 2004).

In the interview following the grocery shopping, the collaborative groups made marginally fewer errors than the nominal groups did when selecting their personal list from a group of items. The nominal groups selected many more false positives than the collaborative groups. In addition, the nominal groups were more successful in detecting the 10 distractor items on the list; however, one again they produced many more false

positives than the collaborative groups (Ross et al, 2004).

This trend continued in the landmark portion of this experiment. While there was not much discrepancy between the number of landmarks correctly listed, the nominal groups produced many more false positives than the collaborative groups (Ross et al, 2004).

This study indicts that false positives are less likely to occur in collaborative groups, because such items are only reasoned by one of the participants and is therefore less likely to be validated by the other partner (Ross et al, 2004).

Each of these literature reviews support the purpose of this experiment, which is to discover if collaborative inhibition occurs with survival processing. In order to test this theory, participants are assigned to either the survival condition or the pleasantness condition. This will allow the relationship between the two conditions to be made evident after the participants are asked to recall collaboratively or individually. The survival condition and the nominal group are predicted to produce more accurate recall performance.

Methods

Participants

One hundred twenty students from the University of Mississippi participated in this experiment to make up 30 two-person nominal groups and 30 two-person collaborative groups. Sixty participants were tested individually while sixty other participants worked as members of two person collaborative groups.

Design

In this experiment a 2 (encoding condition: pleasantness vs. survival) x 2 (recall condition: nominal vs. collaborative) between subjects design was used. The participants were instructed to either rate words on pleasantness or survival and they were placed in either collaborative or nominal recall groups.

Apparatus and materials

Personal computers were used to present all of the stimuli and record all of the responses throughout this experiment.

Procedure

First, the participants listened as the instructor read the instructions for either the pleasantness condition or the survival condition. The instructions indicated that participants in the survival condition should respond given the following instructions: "In this task, we would like you to imagine that you are stranded in the grasslands of a

foreign land, without any basic survival materials. Over the next few months, you'll need to find steady supplies of food and water and protect yourself from predators. We are going to show you a list of words, and we would like you to rate how relevant each of these words would be for you in this survival situation." Furthermore, participants in the pleasantness condition were instructed to respond given another set of instructions: "In this task, we are going to show you a list of words, and we would like you to rate the pleasantness of each word. Some of the words may be pleasant and others may not – it's up to you to decide." Next, they rated 30 common nouns using a five point Likert scale on either the words pleasantness or its usefulness (1 – very unpleasant or not useful, 5 – very pleasant or very useful). Each noun was presented for 5 seconds with a .5 second interval between each word. Following the rating task, participants worked on simple addition and subtraction problems for 30 seconds. After the distractor task, the participants recalled as many words as they could. Those assigned to the collaborative group recalled with another participant and those assigned to the nominal group recalled individually.

Results

The first test run was a 2 (encoding condition) x 2 (recall condition) ANOVA, where the encoding condition determined whether the participant was a part of the survival or pleasantness condition and the test condition determined whether the participant was tested collaboratively or individually. The nominal groups were created with the use of a computer program (Kelley & Wright, 2010) that created 10,000 groups and picked the most representative pairs.

To determine whether participants' recall accuracy differed as a function of encoding condition (survival vs. pleasantness), we examined the result of the main effect for encoding condition in the Analysis of Variance described above. The results indicated that there was a statistically significant difference between the two encoding conditions, $F(1,56) = 18.26$, $p < .0001$. Thus, the participants who encoded the words in terms of survival wrote down significantly more accurate words ($M = 19.8$) than the participant's in the pleasantness encoding condition ($M = 16.7$) (Table 1).

In addition to the encoding condition, the testing condition was also analyzed in the 2 X 2 Analysis of Variance described above. Once again the results indicated a statistically significant difference between the two testing conditions, $F(1,56) = 8.86$, $p < .05$. Overall, the participants in the nominal group ($M = 19.2$) recalled the given list more accurately than those in the collaborative group ($M = 17.3$) (Table 1). Thus the oft replicated phenomenon of collaborative inhibition was observed.

Perhaps most interestingly, the 2 X 2 ANOVA indicated that there was a statistically significant interaction between the encoding and testing conditions, $F(1,56) = 5.93$, $p < .05$. The interaction between the two variables appeared to result from the fact that working with another participant impaired recall in the pleasantness condition but not in the survival encoding condition.

Overall, the participants in the nominal condition that rated words based on pleasantness remembered more items in the list than participants in the collaborative condition that rated words based on pleasantness, $t(58) = 2.23$, $p < .05$. As well as, the participants in the survival condition remembered more than the participants in the pleasantness condition, $t(58) = 3.92$ $p < .0001$.

Discussion

This experiment tested the outcome of two different independent variables. The significance of these two variables was tested and produced a notable outcome. The number of correctly recalled words differed depending on whether or not the participants received the survival or the pleasantness rating as well as whether or not the participants were placed in a collaborative group or worked independently. The results indicate that the words that were rated based on survival were recalled more on average than those rated based on pleasantness. Additionally, those in the nominal groups recalled more words, on average, than those in the collaborative groups.

The results of this experiment were similar to other studies of this kind. The study conducted by Nairne, Pandeirada, and Thompson on adaptive memory also experimented with the idea that memory retention is higher when the items to be recalled are associated with survival. This is likely due to every human's expertise on surviving. As adaptive beings it is our nature to adapt and respond to events that potentially increase or decrease our chances of survival.

Michelle L. Meade, Timothy J. Nokes, and Daniel G. Morrow put this theory to the test in their experiment "Expertise Promotes Facilitation on a collaborative Memory Task." Their pilot study revealed that individuals with an expertise on the topic of the tested material had more successful memory recall than those with little to no experience on the topic of the tested material. Therefore, the likely reason that subjects tend to recall words in the survival condition more accurately is because all humans are experts in survival: it is in our biological nature.

The second variable tested is whether or not collaborative or nominal groups have

better recall. The results of Weldon and Bellinger's study, "Collective Memory: Collaborative and Individual Processes in Remembering," agreed with the results of this experiment. The following experiment suggests that nominal groups produced more accurate recall. This result is likely due to collaborative inhibition. Attempting to remember given words or images in collaborative groups hinders recall. The influence of others prevents total individual recall unlike in nominal groups.

The pilot study previously described, also sheds light on collaborative inhibition. This experiment revealed a condition where collaborative inhibition was eliminated. While the expert pilots produced more accurate memory recall, they also overcame the disadvantage of collaborative recall. Since all of the members of the collaborative groups were experts they were able to enhance recall ability because their knowledge on the topic being tested served as recall cues. The experts were less distracted by the simple information and could; therefore, focus more attention on more complex information. Thus, in regards to survival, it is resolved that since people are experts in survival collaborative inhibition would not be present in in survival processing groups.

In the future, the test should be conducted with a larger and more diverse population. While this test produced statistically significant results, all of the participants were university students; therefore, they were not a clear representation of the population as a whole. Additionally, further research on the impact of expertise on collaborative inhibition would aid the evidence detected in this study.

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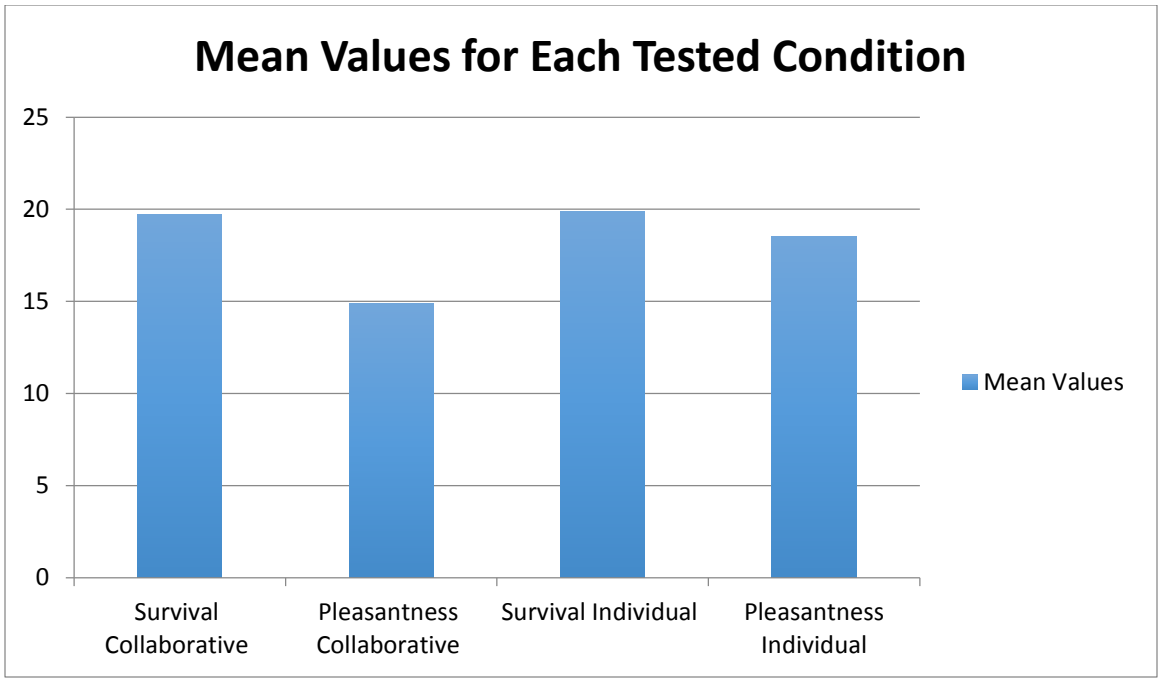
Mean Values for Each Tested Condition
25
20
15
10
5
0
Survival Collaborative
Pleasantness Collaborative
Survival Individual
Pleasantness Individual
Mean Values